AF/1762

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPEAL BRIEF FOR THE APPELLANT

Hideki MUNAKATA

WAFER STORAGE CASE, PROCESS FOR PREVENTING DUST GENERATION THEREOF AND WAFER STORAGE METHOD

Serial Number: 09/926,173
Filed: September 18, 2001
Appeal No.:
Group Art Unit: 1762
Examiner: Markham, Wesley D.

Submitted herewith is an Appeal Brief. A check in the amount of Five Hundred Dollars ($500.00) is enclosed to cover the official fees for the Appeal Brief. Please charge any fee deficiencies required with respect to this paper, or overpayment to our Deposit Account No. 01-2300, **referencing docket number 107242-00021.**

Respectfully submitted,

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Date: January 13, 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Appellant:

Hideki MUNAKATA — Group Art Unit: 1762

Serial Number: 09/926,173 — Examiner: Wesley D. MARKHAM

Filed: September 18, 2001 — Attorney Docket No.: 107242-00021

For: WAFER STORAGE CASE, PROCESS FOR PREVENTING DUST GENERATION THEREOF AND WAFER STORAGE METHOD

BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Date: January 13, 2005

This is an appeal from the action of the Examiner dated July 20, 2004, finally rejecting Claims 3-10 and 12, all of the non-canceled claims pending in the above-identified patent application, as being unpatentable over certain prior art under 35 U.S.C. §103. A Notice of Appeal was timely filed on November 17, 2004 with a Petition for Extension of Time.

I. REAL PARTY IN INTEREST

The real party in interest of the above-identified application on appeal is Shin-Etsu Handotai Co., Ltd of Tokyo, Japan.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the Appellant, Appellant's representative or Assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 3-10 and 12 are being appealed. Claims 1-2 and 11 were canceled without prejudice or disclaimer by the Appellant in the Response of April 27, 2004.

IV. STATUS OF AMENDMENTS

All amendments to the claims on appeal have been entered.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A. State of Technology

As the Appellant explained in the *Background Art* section of the originally filed application, the recent development of large-scale integration of semiconductor integrated circuits and the development of relatively large capacity recording media requires a higher level of cleanliness in the wafers used to manufacture the circuits and recording media. A reason the wafers are held to a high level of cleanliness is because wafers with even a relatively small number of particles on the surface thereof generate pattern defects in the semiconductor integrated circuits as well as recording errors in the recording media made therefrom. Wafers are commonly stored in wafer storage cases. Accordingly, when a wafer storage case storing wafers becomes contaminated, the wafers in the wafer storage case cannot maintain their required high level of

cleanliness. Therefore, the wafers and the wafer storage cases storing the wafers must maintain a high level of cleanliness.

Figures 9-11 of the originally filed application illustrate the overall fundamental structure of a conventional wafer storage case 12, which includes a case body 14 that is used to house the wafers W therein and a lid 16 that closes an upper opening section of the case body 14. A substrate-housing cassette 18 is mounted into the case body 14 and houses a plurality of the wafers W. See Appendix 2 for the drawing figures filed with the originally filed application.

The wafer storage case 12 is commonly manufactured from synthetic resin, such as polypropylene and polycarbonate, materials which prevent contamination from dust particles and/or chemicals, are convenient or easy to handle, and are relatively cost effective. The Appellant notes several conventional cleaning methods are used to maintain the wafer storage case 12 at a high level of cleanliness, such as, for example, ultrasonic cleaning with ultrasonic waves, shower cleaning using high water pressure, brush cleaning in which the wafer storage case 12 is rubbed with a brush, and other such cleaning methods.

The Appellant identified surfactant, organic solvent, and acid as being among the types of liquids used during the process of cleaning wafer storage cases 12, in addition to pure water. As shown in Figure 12 (Appendix 2), the steps of a conventional method to clean a wafer storage case 12 using a surfactant are illustrated. In particular, the conventional cleaning method includes a surfactant cleaning step (a), a first pure water cleaning step (b) where the pure water has been subjected to an ion exchange

treatment, a second pure water cleaning step (c) where the pure water is ultra pure, and a clean oven drying step (d).

The Appellant also noted that as the required level of wafer storage case cleanliness has become as high as the required cleanliness level of wafers, the conventional cleaning methods have rapidly been approaching their limits in terms of cleaning capability. Yet, despite wafer storage cases being cleaned by the conventional cleaning methods using ultra pure cleaning liquid, the Appellant noted the presence of undesirable particles on wafers housed in wafer storage cases increases when the wafers and wafer storage cases are being transported.

B. A Source of Particle Generation Problem Identified

Appellant noted that in the conventional cleaning methods, wafer storage cases are manufactured from synthetic resin, a material having a surface that is hydrophobic, has poor wettability, and therefore should avoid contact with water. For these reasons, the Appellant explains that even with physical energy, such as ultrasonic waves, being applied to the surface of the wafer storage case, a physical action thereof is not sufficiently transferred to the surface of the synthetic resin such that any particles on the surface thereof cannot be efficiently removed.

The Appellant also further noted that wafer storage cases made of synthetic resin constantly generate particles from the surface of the synthetic resin, regardless of the number of times the synthetic resin wafer storage case is subjected to high purity cleaning, because the surface of the synthetic resin is porous. Put simply, the Appellant has clearly explained that subjecting a wafer storage case made of synthetic resin to ultrasonic waves is not desirable since the surface of the synthetic resin material from

which the storage case is made will continuously generate particles due to the porous nature of synthetic material.

C. The Claimed Invention

Independent Claim 3 recites a process for preventing dust generation of a wafer storage case, including the steps of: coating a surface of the wafer storage case of synthetic resin housing wafers with a coating agent; drying the wafer storage case coated with the coating agent; cleaning the dried wafer storage case and removing particles on a surface of a coating layer using pure water such that the coating layer of the coating agent remains across the surface of the wafer storage case; and drying the cleaned wafer storage case, wherein dust generation from the surface of the wafer storage case is prevented by the coating layer of the coating agent.

Independent Claim 4 recites a process for preventing dust generation of a wafer storage case, including the steps of: coating a surface of the wafer storage case of synthetic resin housing wafers with a coating agent; cleaning the wafer storage case and removing particles on a surface of a coating layer using pure water such that the coating layer of the coating agent remains across the surface of the wafer storage case; and drying the cleaned wafer storage case, wherein dust generation from the surface of the wafer storage case is prevented by the coating layer of the coating agent.

Claims 5-10 and 12 depend, either directly or indirectly, from Claims 3 and 4.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 3-10 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Applicant's Admitted Prior Art (hereinafter "AAPA") in view of Fujitsu (JP 09-122610) and Claims 5-10 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over the AAPA in view of Fujitsu and U.S. Patent No. 6,158,721 to Katou et al. (hereinafter "Katou").

VII. ARGUMENT

A. The Law

1. The law regarding factual inquiries to determine obviousness/non-obviousness.

Several basic factual inquiries must be made to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103. These factual inquiries are set forth in Graham v. John Deere Co., 383 U.S. 1,17,148 U.S.P.Q. 459, 467 (1996):

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; the level of ordinary skill in the pertinent art resolved. Against this backdrop, the obviousness or non-obviousness of the subject matter is determined.

The specific factual inquiries set forth in *Graham* have not been considered or properly applied by the Examiner formulating the rejections of Claims 3-10 and 12. Particularly the differences between the prior art and the claims were not properly determined. As stated by the Federal Circuit in In re Ochiai, 37 U.S.P.Q. 2d 1127, 1131 (Fed. Cir. 1995):

> [t]he test of obviousness *vel non* is statutory. It requires that one compare the claim's subject matter as a whole with a prior art to which the subject matter pertains. 35 U.S.C. § 103.
>
> The inquiry is highly fact-specific by design.... When the references cited by the Examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). (Emphasis added.)

When rejecting claims under 35 U.S.C. § 103, an Examiner bears an initial burden of presenting a *prima facie* case of obviousness. A *prima facie* case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. See: In re Rijckaert, 9 F.3d 1531, 28 U.S.P.Q. 2d. 1955 (Fed. Cir. 1993). "If examination.... does not produce a prima facie case of unpatentability, then without more the applicant is entitled to the grant of the patent." In re Oetiker, 977 F.2d 1443, 1445-1446 24 U.S.P.Q. 2d. 1443, 1444 (Fed. Cir. 1992).

B. Rejections of Claims 3-10 and 12 under 35 U.S.C. §103(a) over AAPA, Fujitsu, and Katou

1. Argument

In the Office Action of July 20, 2004, the Examiner rejected Claims 3-10 and 12 under 35 U.S.C. §103(a) as being unpatentable over the AAPA in view of Fujitsu (JP 09-122610). Claims 5-10 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over the AAPA in view of Fujitsu and U.S. Patent No. 6,158,721 to Katou et al. (hereinafter "Katou").

As noted in section V.C. of this Brief, independent Claims 3 and 4 each recite, among other features, that a surface of a wafer storage case of synthetic resin is coated with a coating agent. Claims 3 and 4 also recite that a coating layer of the coating agent remains across the surface of the wafer storage case after a cleaning step using pure water.

Appellant notes the July 20 Office Action admitted the AAPA does not teach or suggest: 1) drying the wafer storage case coated with the coating agent (a feature recited only in Claim 3); 2) that a coating layer of the coating agent (i.e., the surfactant) remains across the surface of the wafer storage case after the pure water cleaning steps; and 3) that dust generation from the surface of the wafer storage case is prevented by the aforementioned coating layer of the coating agent.

The July 20 Office Action asserted Fujitsu teaches a process for cleaning and drying various articles that is analogous to the process taught by the AAPA. The July 20 Office Action further asserted it would have been obvious to one of ordinary skill in the art to use the Fujitsu process as the wafer storage case cleaning process of the AAPA with reasonable expectation of success as the Fujitsu process of cleaning and removing dust is applicable to hollow articles and resin articles.

In a Response to Final Rejection Under 37 C.F.R. §1.121 submitted October 8, 2004, the Appellant argued that one of ordinary skill in the art would not find it obvious to look to the teachings of Fujitsu to overcome the above-listed, and Office Action admitted, deficiencies of the AAPA. In particular, the Appellant acknowledged that Fujitsu explicitly teaches immersing a washed object in an aqueous solution, which contains a surfactant. This feature is taught by Fujitsu in the Abstract, as well as

paragraphs [0007], [0008], [0009], [0013], [00014], [0015], [0016], [0017], etc. However, the Appellant further noted that Fujitsu clearly and unambiguously teaches the aqueous solution in which the object is immersed is impressed or charged with an ultrasonic wave. See the Abstract, as well as paragraphs [0007], [0008], [0009], [0013], [00014], [0015], [0016], [0017], etc. of Fujitsu.

As explained in section V.A. of this Brief and the paragraph on page 4, lines 3-11 of the originally filed application, the Appellant respectfully notes the surface of a storage case made of synthetic resin is hydrophobic, has poor wettability, and therefore should avoid contact with water. Moreover, even when subjected to physical energy, such as ultrasonic waves, a physical action thereof is not sufficiently transferred to the surfaces of the synthetic resin and particles thereon so that efficient particle removal cleaning is not performed, which obviously results in poor cleaning results. As explained in section V.A. of this Brief and in the originally filed application, i.e., the paragraph bridging pages 4-5, wafer storage cases made of synthetic resin constantly generate particles from the surface of the synthetic resin, regardless of the number of times the synthetic resin wafer storage case is subjected to high purity cleaning, because the surface of the synthetic resin is porous. Put simply, the Appellant has clearly explained, in the originally filed application, in the Responses to Office Actions, and now in the instant Brief, that subjecting a storage case made of synthetic resin to ultrasonic waves is not desirable since the surface of the synthetic resin material from which the storage case is made will continuously generate particles due to the porous nature of synthetic material. Claims 3 and 4 each recite, among other features, that a surface of a wafer storage case of synthetic resin is coated with a coating agent.

In the October 8 Response, the Appellant articulated the position that it would not have been obvious to one of ordinary skill in the art to use the Fujitsu cleaning process of impressing an aqueous solution in which an article is immersed with ultrasonic waves as the wafer storage case cleaning process of the AAPA, wherein the case is made of synthetic resin, since articles made of synthetic resin constantly generate particles from the surface of the synthetic resin because of the porous nature of synthetic materials. Put simply, the Appellant argued in the October 8 Response that it would not have been obvious to one of ordinary skill in the art to use the Fujitsu cleaning process, which entails impressing ultrasonic waves onto an aqueous solution in which an object is immersed, as the synthetic material made wafer storage case cleaning process of the AAPA because the surface of the synthetic material would continuously generate particles due to the porous nature of synthetic material, which would inherently and obviously defeat the purpose of the cleaning process.

In an Advisory Action dated November 1, 2004, the Examiner stated the arguments presented by the Appellant in the October 8 Response were considered but deemed not persuasive. The reasons given by the Examiner for not being persuaded by the arguments in the October 8 Response were detailed in paragraphs 2-3 of the Advisory Action. In particular, Appellants note the Examiner oversimplified the basis of the arguments traversing the rejections of Claims 3-10 and 12. Specifically, the Examiner stated the October 8 Response argued that since synthetic resin wafer storage cases continuously generate particles, the purpose of the cleaning process of Fujitsu would inherently and obviously be defeated and that since a wafer storage case made of synthetic resin continuously generates particles, it would not have been

obvious to clean the case in the manner taught by Fujitsu. Appellants respectfully disagree with the Examiner's characterization of the arguments presented in the October 8 Response.

Appellants note the October 8 Response argued it would not have been obvious to one of ordinary skill in the art to look to the teachings of Fujitsu to overcome the deficiencies of the APAA. See the first full paragraph on page 3 of the October 8 Response. In particular, the October 8 Response noted the surface of a storage case made of synthetic material is hydrophobic, has poor wettability, and should avoid contact with water. The October 8 Response then noted that even when subjected to physical energy, such as ultrasonic waves, a physical action thereof is not sufficiently transferred to the surfaces of the synthetic material and particles thereon so that efficient particle removal cleaning is not performed, which obviously results in poor cleaning results. Additionally, the October 8 Response argued that because the surface of the synthetic material or resin is porous, wafer storage cases made of synthetic resin constantly generate particles from the surface of the synthetic resin, regardless of the number of times the synthetic resin wafer storage case is subjected to high purity cleaning. Accordingly, the October 8 Response clearly argued that subjecting a storage case made of synthetic resin to ultrasonic waves is not desirable since the surface of the synthetic resin material from which the storage case is made will continuously generate particles due to the porous nature of synthetic material.

Appellants respectfully submit the October 8 Response did not argue that simply because a wafer storage case continuously generates particles, it would not have been obvious to one of ordinary skill in the art to the clean the case in the manner taught by

Fujitsu. Rather, the reasoned argument traversing the rejections of Claims 3-10 and 12 was presented in the second full paragraph on page 4 of the October 8 Response, which reads as follows:

> . . . Applicant respectfully submits that it would not have been obvious to one of ordinary skill in the art to use the Fujitsu cleaning process of impressing an aqueous solution in which an article is immersed with ultrasonic waves as the wafer storage case made of resin material cleaning process of the AAPA since articles made of synthetic resin constantly generate particles from the surface of the synthetic resin because of the porous nature of resinous materials. Put simply, the Applicant respectfully submits that it would not have been obvious to one of ordinary skill in the art to use the Fujitsu cleaning process, which entails impressing ultrasonic waves onto an aqueous solution in which an object is immersed, as the resin wafer storage case cleaning process of the AAPA because the surface of the resin material would continuously generate particles due to the porous nature of synthetic resin, which would inherently and obviously defeat the purpose of the cleaning process.

Moreover, the Appellant notes the Advisory Action asserted the Appellant's claims do not exclude charging an ultrasonic wave to the cleaning solution and that as such, the fact that Fujitsu uses such an ultrasonic wave in the cleaning process does not serve to render the Appellant's claims patentable. Appellant respectfully submits, as noted above, that independent Claims 3-4 each recite that the surface of the wafer storage case is made of synthetic resin. Appellants also submit that wafer storage cases manufactured from synthetic resin are hydrophobic, have poor wettability, and should avoid contacting water. Appellant has also pointed out that subjecting wafer storage cases made of synthetic resin to ultrasonic waves is not desirable since the surface of the synthetic resin material will continuously generate undesirable and potentially damaging particles due to the porous nature of the synthetic material. Appellant has not and does not argue that because Fujitsu uses ultrasonic waves to

clean an article that Appellants claims are patentable. Rather, Appellant has argued and maintains that one of ordinary skill in the art would not deem it obvious to look to the teachings of Fujitsu to overcome the deficiencies in the AAPA. A reason submitted by the Appellant for why one of ordinary skill in the art would not look to Fujitsu to overcome the deficiencies of the AAPA is because modifying the method steps of the AAPA to include the step of impressing an ultrasonic wave, as provided by the Fujitsu process, onto a wafer storage case made of synthetic resin would defeat the very purpose of cleaning the wafer storage case. That is, the modified AAPA/Fujitsu method would result in a wafer storage case made of synthetic resin that continuously generated the undesirable and potential damaging particles because of the porous nature of synthetic material and how such material reacts after being subjected to ultrasonic waves in an aqueous solution.

Additionally, the Appellant notes the Advisory Action summarized Appellants arguments in the October 8 Response as being that since a wafer storage case continuously generates particles, it would not have been obvious to clean the case in the manner taught by Fujitsu. Appellant respectfully submits the Examiner has parsed and thereby mischaracterized the Appellants arguments. In particular, as exhaustively explained in this Brief, the October 8 Response, the April 27 Response, and the originally filed application, wafer storage cases made of synthetic resin that are subjected to ultrasonic waves generate undesirable and potentially damaging particles because of the porous nature of the synthetic material and how such materials react to the ultrasonic wave. At no time has the Appellant argued that *all* wafer storage cases

continuously generate particles if subjected to ultrasonic waves, as taught by the Fujitsu method.

The Advisory Action further asserts that the AAPA teaches cleaning synthetic resin wafer storage cases is a conventional process and that the generation of dust particles from the surface of the wafer storage case subsequent to cleaning would not have discouraged one of ordinary skill in the art from the cleaning the case in the manner taught by Fujitsu because doing so would have, at the very least, been expected to reduce the amount of dust and particles on the storage case. The Advisory Action then boldly asserts that the layer of surfactant in the Fujitsu method would have prevented or blocked the generation of particles form the surface of the wafer storage case. Appellant, at the very least, respectfully disagrees with the assertions made in the Advisory Action as the assertions appear to completely disregard the Appellant's explanation of the art in the *Background Art* section of the originally filed application.

In particular, Appellants respectfully submit that the July 20 Office Action admits to the AAPA lacking several features recited by Claims 3-4 of the instant application. Specifically, the July 20 Office Action admits the AAPA does not teach or suggest: 1) drying the wafer storage case coated with the coating agent (a feature recited only in Claim 3); 2) that a coating layer of the coating agent (i.e., the surfactant) remains across the surface of the wafer storage case after the pure water cleaning steps; and 3) that dust generation from the surface of the wafer storage case is prevented by the aforementioned coating layer of the coating agent.

Moreover, Appellants respectfully submit the AAPA, like Fujitsu, has a layer of surfactant on the article yet does not prevent the generation of particles thereon. Also,

the Appellant has exhaustively explained that wafer storage cases made of synthetic material that are subject to ultrasonic waves generate particles because of the porous nature of the synthetic material. In the absence of Fujitsu teaching an article made of synthetic material that is subjected to ultrasonsic waves does not generate particles, Appellant respectfully submits one or ordinary skill in the art would not deem it obvious to modify the AAPA according to the Fujitsu method for the reasons discussed above.

Appellant further notes Katou simply teaches controlling the resistivity of pure water used in a cleaning process and does not address or overcome the drawbacks of the AAPA and/or Fujitsu teachings.

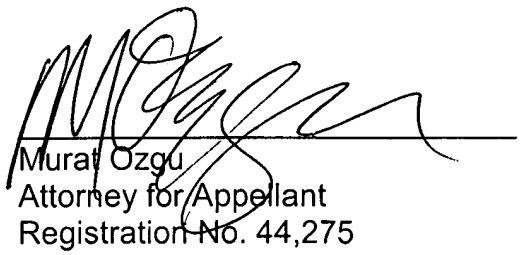
VIII. CONCLUSION

For all of the above-noted reasons, it is strongly contended that certain clear differences exist between the present invention as recited in Claims 3-10 and 12 and the applied art of record relied upon by the Examiner. It is further contended that these differences are more than sufficient that the present invention would not have been obvious to a person having ordinary skill in the art at the time the invention was made.

The final rejection being an error, therefore, it is respectfully requested that this Honorable Board of Patent Appeals and Interferences reverse the Examiner's decision in this case and indicate the allowability of application Claims 3-10 and 12.

In the event that this paper is not being timely filed, the Appellant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees which may be due with respect to this paper, may be charged to Counsel's Deposit Account No. 01-2300, **referencing docket number 107242-00021**.

Respectfully submitted,



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APPENDIX 1

CLAIMS ON APPEAL

1. (**Canceled**).

2. (**Canceled**).

3. (**Previously Presented**) A process for preventing dust generation of a wafer storage case comprising the steps of:

coating a surface of the wafer storage case of synthetic resin housing wafers with a coating agent;

drying the wafer storage case coated with the coating agent;

cleaning the dried wafer storage case and removing particles on a surface of a coating layer using pure water such that the coating layer of the coating agent remains across the surface of the wafer storage case; and

drying the cleaned wafer storage case,

wherein dust generation from the surface of the wafer storage case is prevented by the coating layer of the coating agent.

4. (**Previously Presented**) A process for preventing dust generation of a wafer storage case comprising the steps of:

coating a surface of the wafer storage case of synthetic resin housing wafers with a coating agent;

cleaning the wafer storage case and removing particles on a surface of a coating layer using pure water such that the coating layer of the coating agent remains across the surface of the wafer storage case; and

drying the cleaned wafer storage case,

wherein dust generation from the surface of the wafer storage case is prevented by the coating layer of the coating agent.

5. (**Original**) The process for preventing dust generation of a wafer storage case according to claim 4, wherein the pure water used in the step of cleaning with the pure water such that the coating layer of the coating agent remains across the surface of the wafer storage case is pure water with a low specific resistance.

6. (**Original**) The process for preventing dust generation of a wafer storage case according to claim 5, wherein the pure water with a low specific resistance has a specific resistance of 10 MΩ·cm or less.

7. (**Original**) The process for preventing dust generation of a wafer storage case according to any of claims 3 to 6, wherein by immersing the wafer storage case in an aqueous solution of a coating agent, the surface of the wafer storage case is coated with the coating agent.

8. (**Previously Presented**) The process for preventing dust generation of a wafer storage case according to any of claims 3 to 6, wherein the wafer storage case to be coated with the coating agent is a cleaned wafer storage case.

9. (**Original**) The process for preventing dust generation of a wafer storage case according to claim 8, wherein the cleaned wafer storage case is a wafer storage case cleaned with surfactant cleaning and pure water cleaning.

10. (**Previously Presented**) The process for preventing dust generation of a wafer storage case according to any of claims 3 to 6, wherein the coating agent is a surfactant.

11. (**Canceled**).

12. (**Previously Presented**) A wafer storing method comprising the steps of:

preparing wafers; and

housing the wafers in a wafer storage case treated by a process for preventing dust generation of a wafer storage case according to any of claims 3 to 6.

FIG. 1

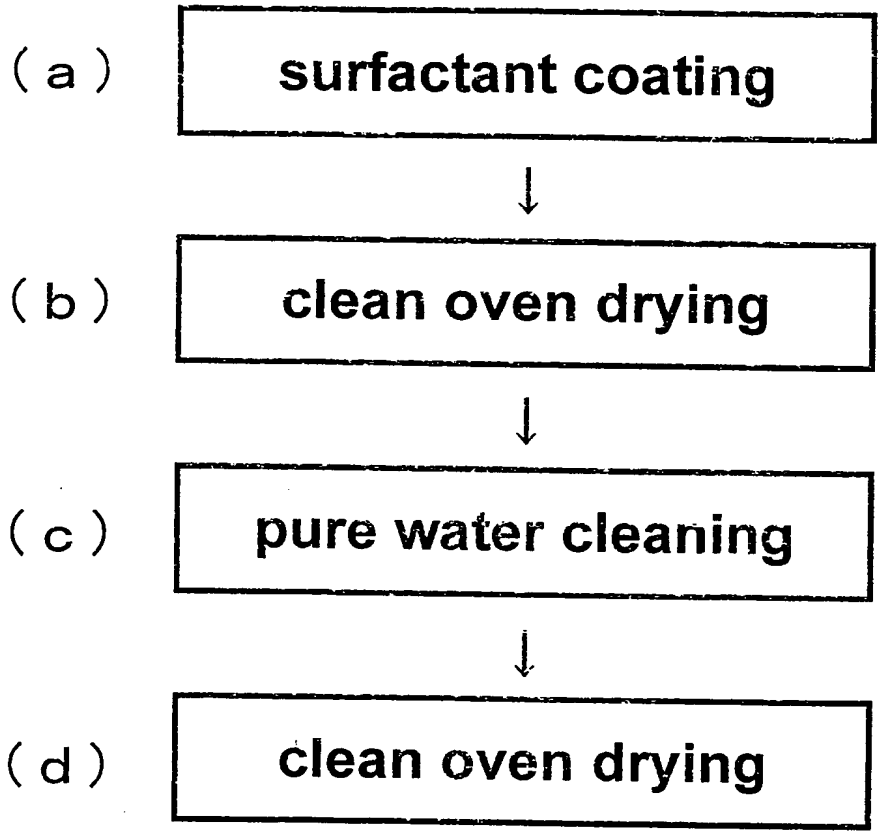


FIG. 2

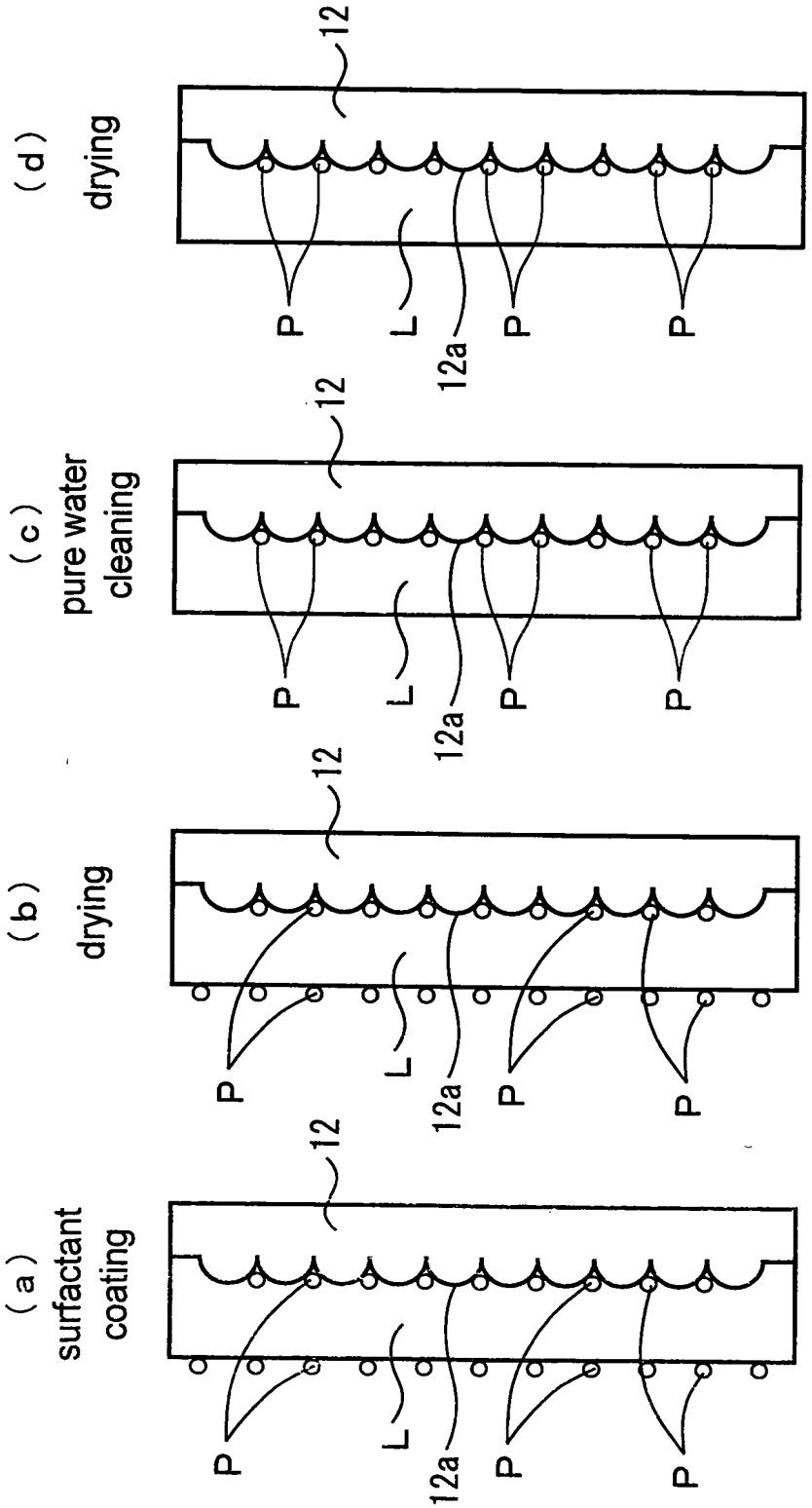
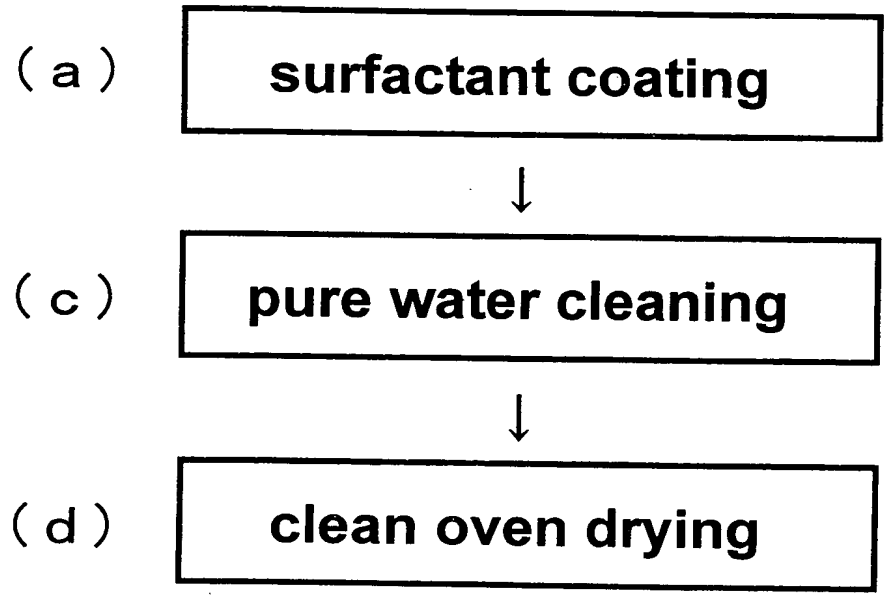


FIG. 3



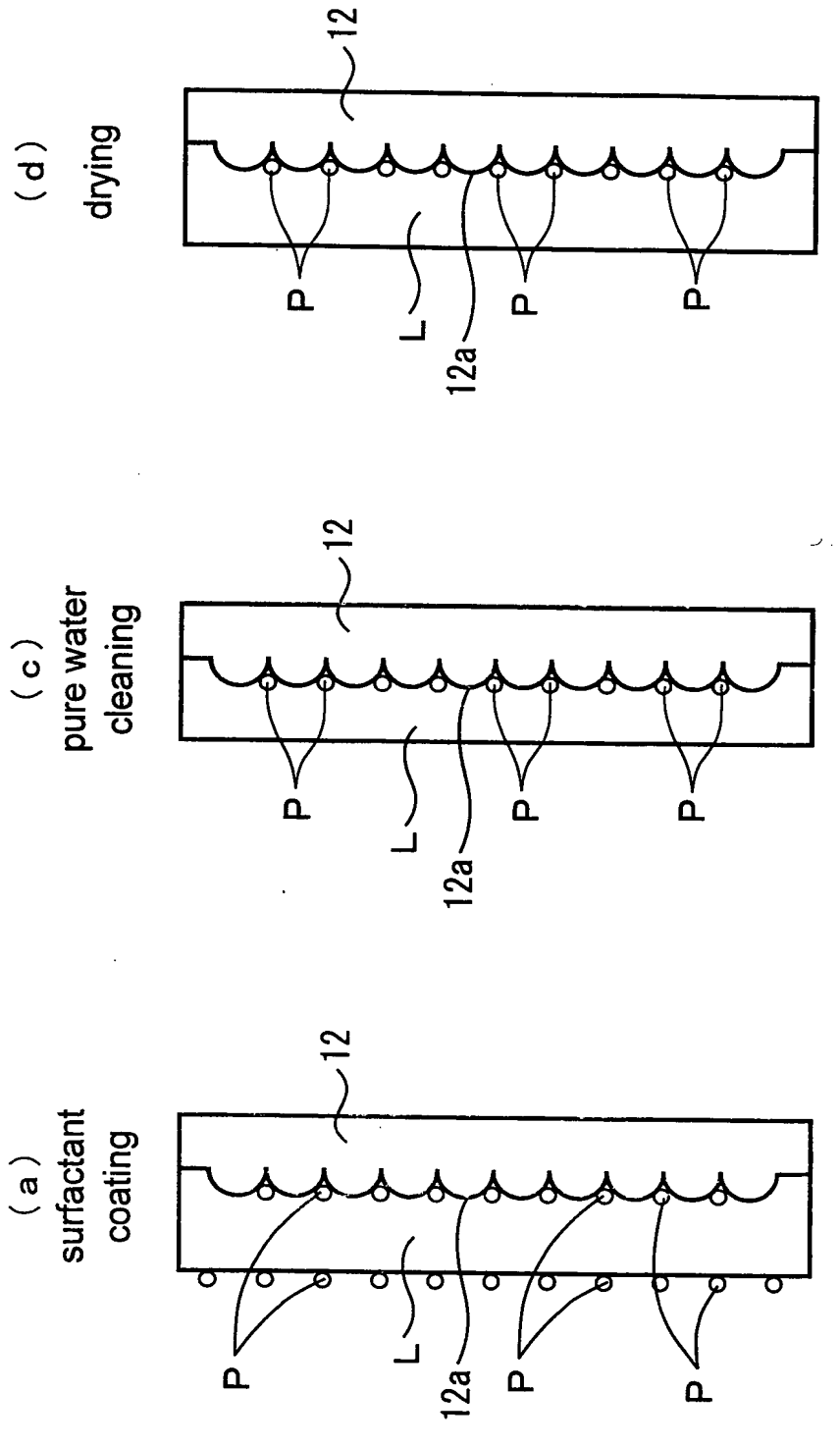


FIG. 4

FIG. 5

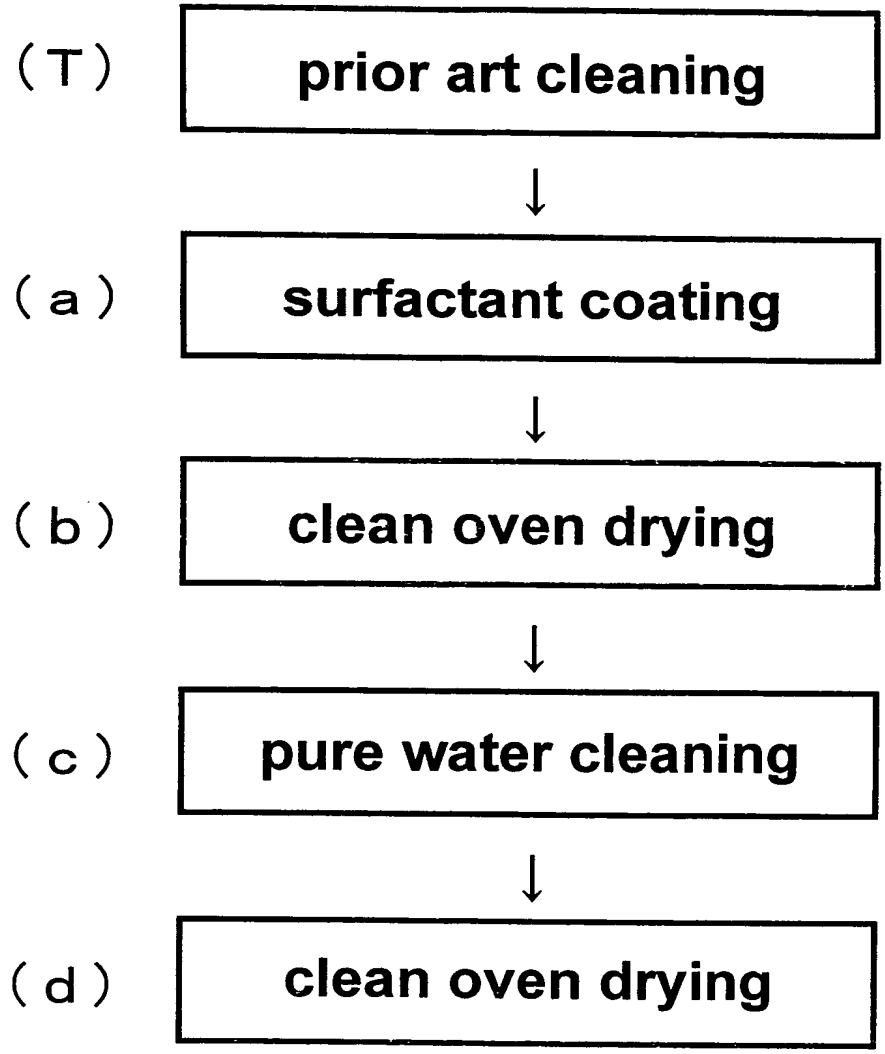


FIG. 6

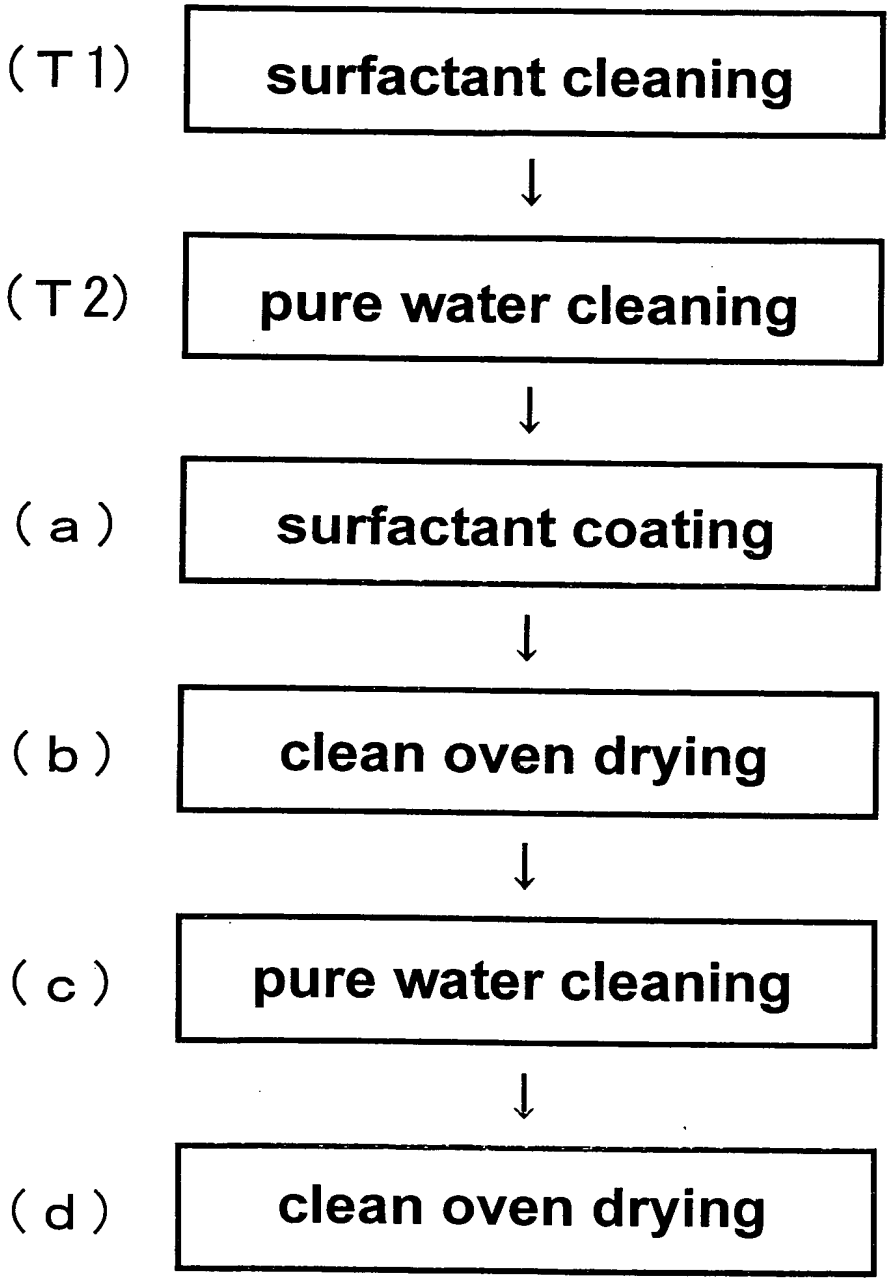


FIG. 7

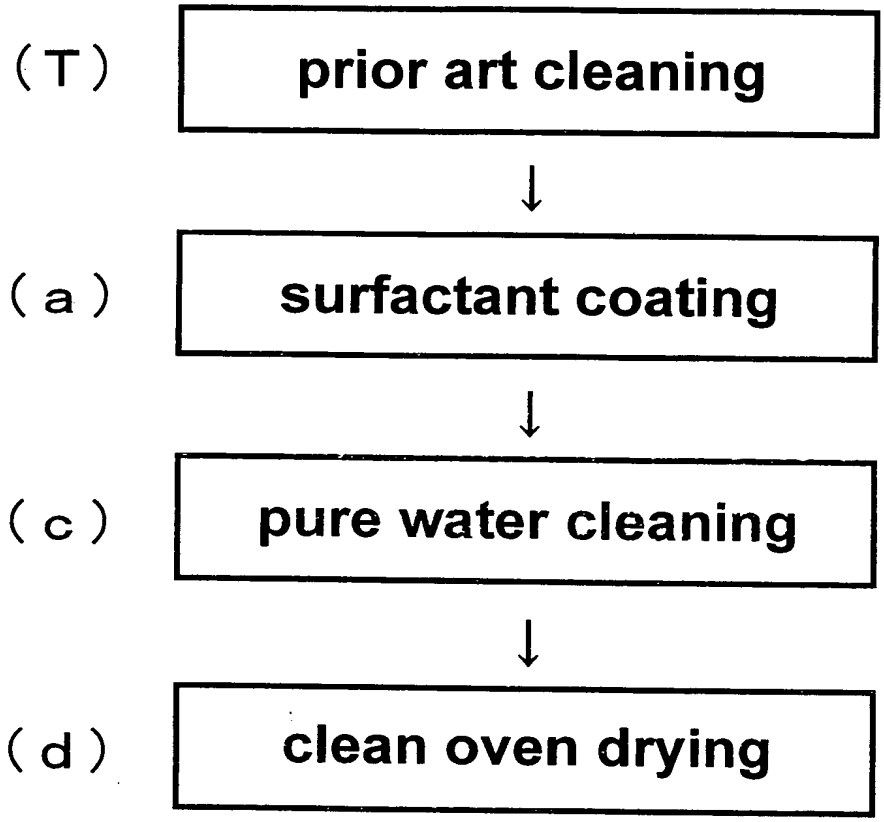


FIG. 8

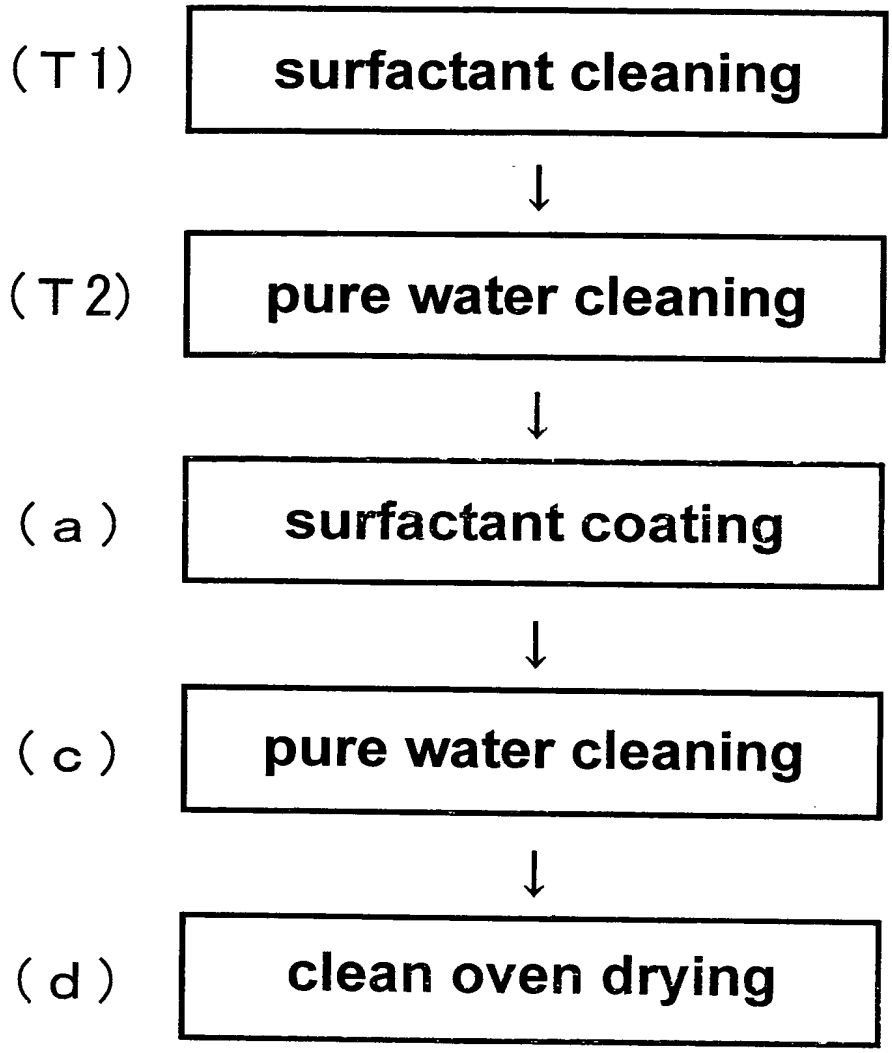


FIG. 9
PRIOR ART

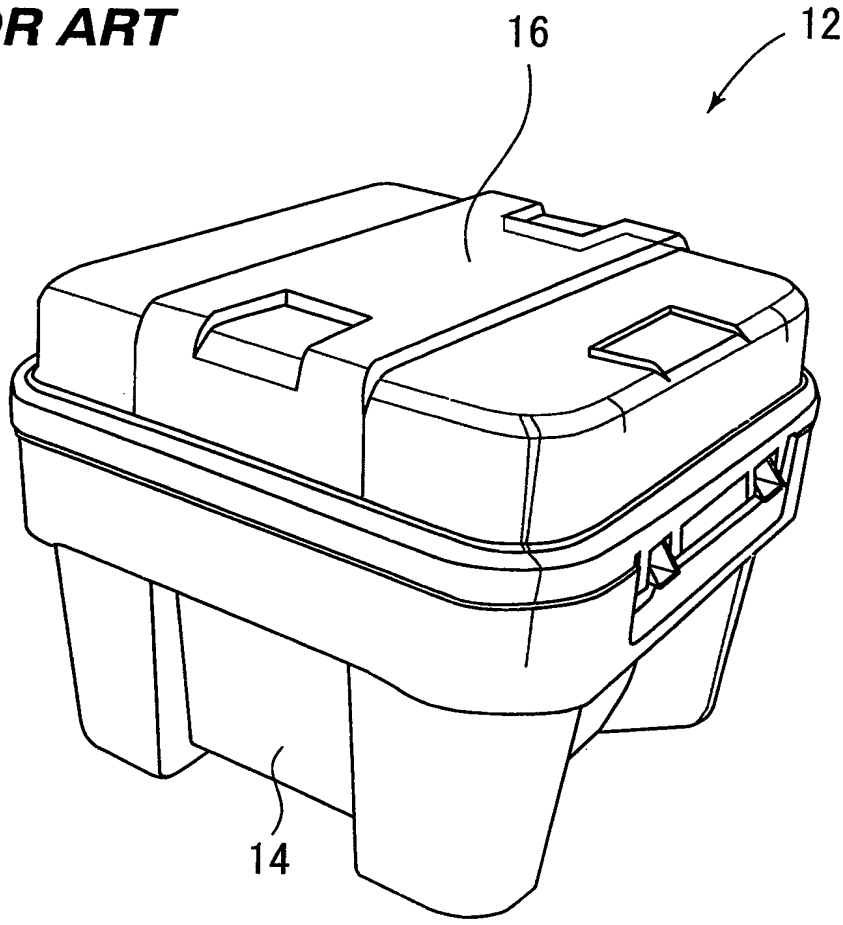


FIG. 10
PRIOR ART

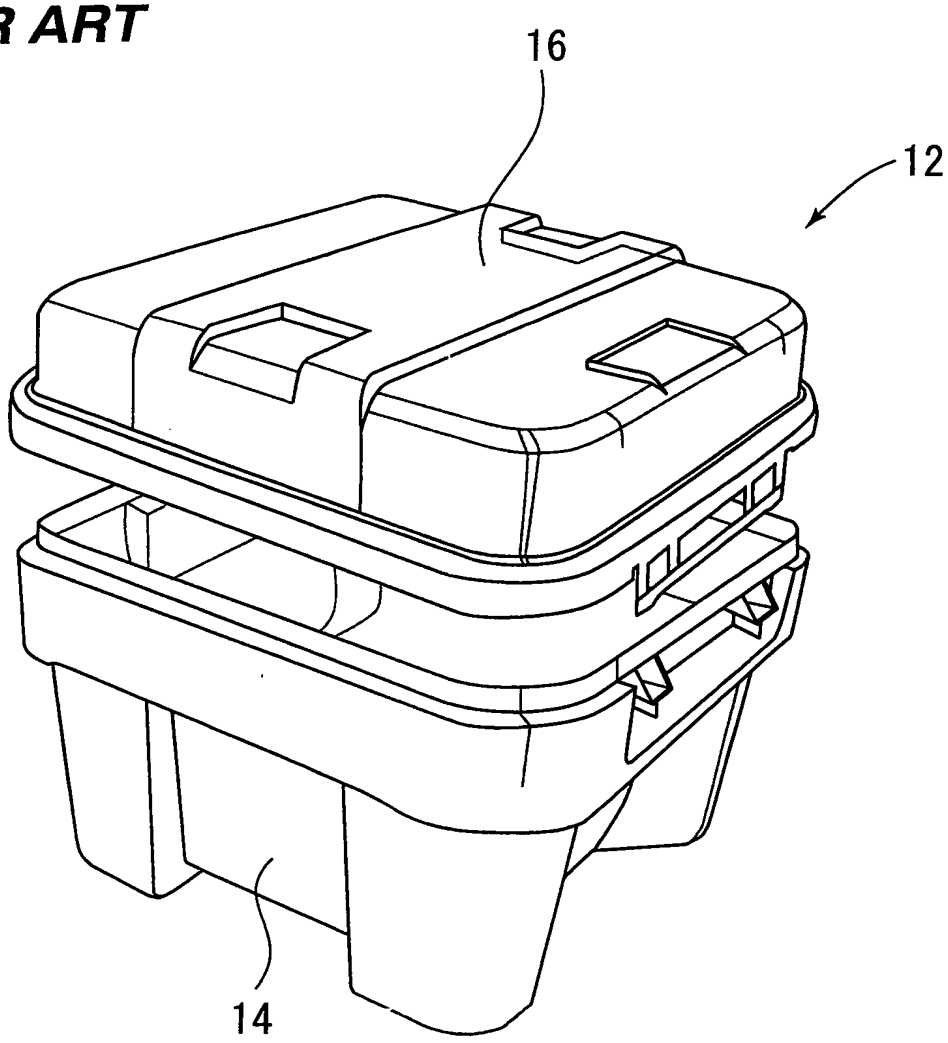


FIG. 11
PRIOR ART

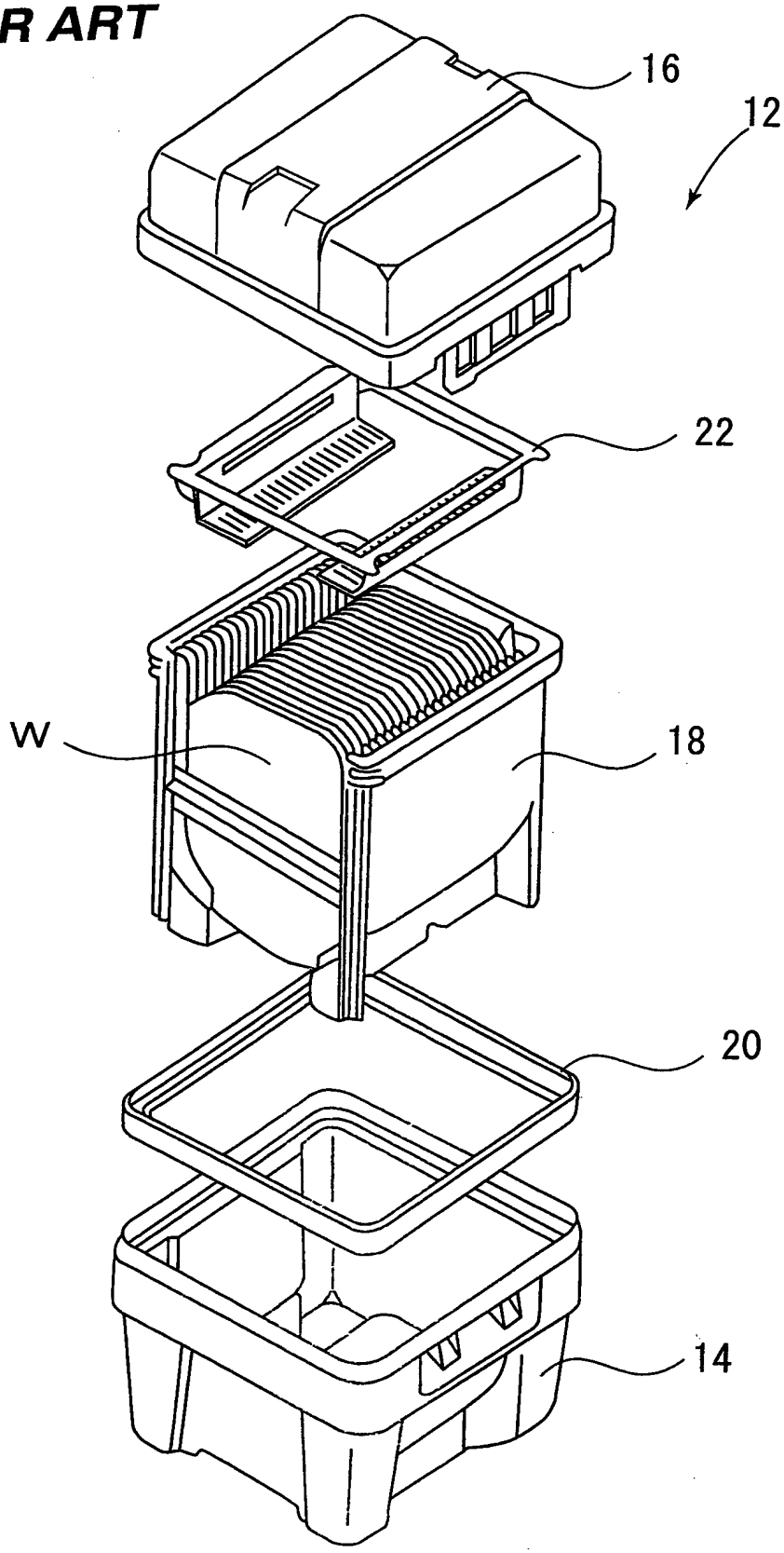


FIG. 12
PRIOR ART

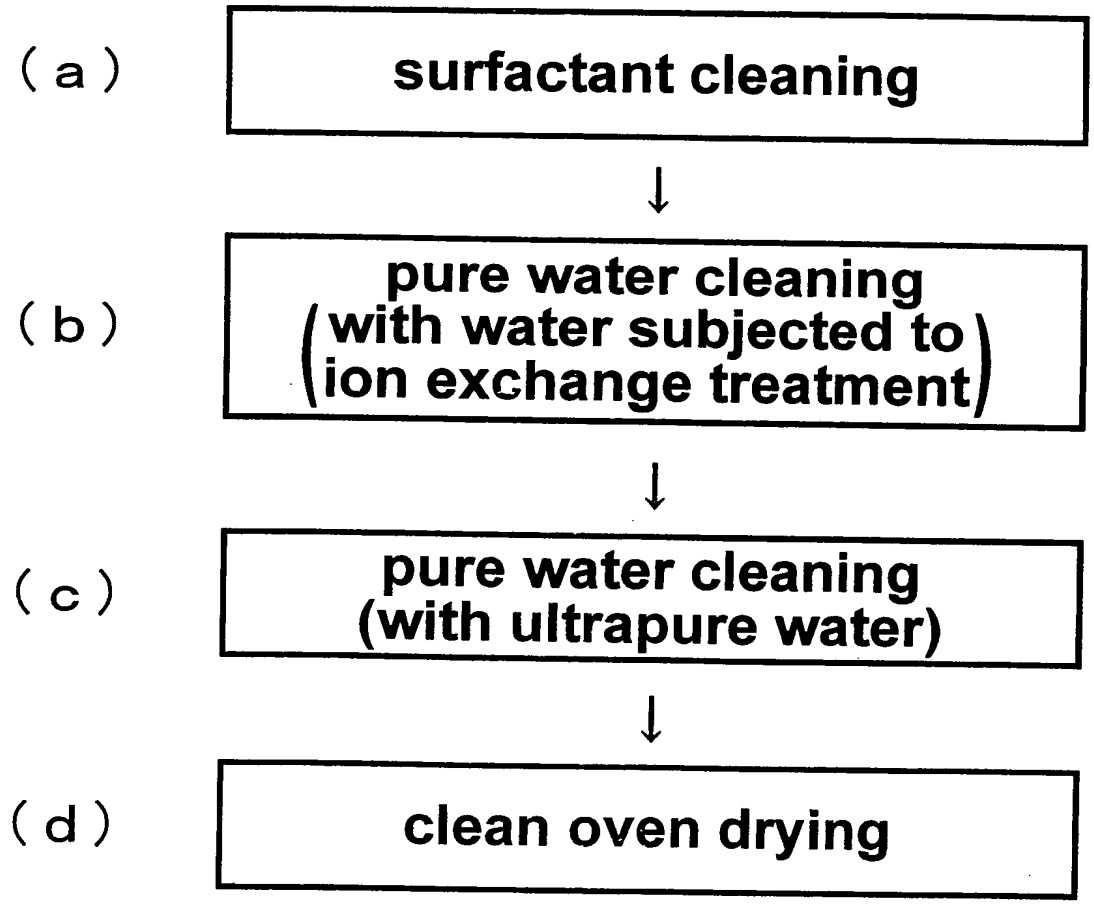


FIG. 13

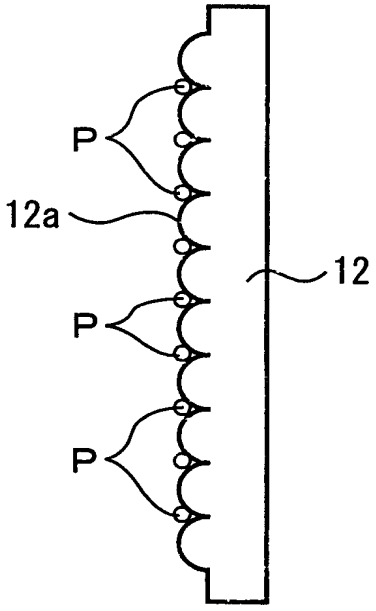


FIG. 14
PRIOR ART